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Rubber Research Scheme

(CEYLON).

Fourth Quarterly Circular

FOR

1924.

IMPERIAL BUREAU
25 MAR. 1927
OF MYCOLOGY

Peradeniya, January, 1925.

[THIS CIRCULAR IS PRINTED ON RUBBER LATEX PAPER.]

GENTLEMEN,

Herewith the Fourth Quarterly Circular for 1924 dealing with the following subjects :—

"Experiments on Smoking Rubber."
"Tests with Glass Hydrometers for Latex."
By T. E. H. O'Brien, Chemist.

"Possible effect of Stocks on Scions in budded Rubber."
By R. A. Taylor, Physiological Botanist.

"First Report on Rubber prepared with Sodium Silicofluoride as coagulant."
"Second Report on Rubber prepared with Sodium Silicofluoride as coagulant."
"Third Report on Rubber prepared with Sodium Silicofluoride as coagulant."
Received from the London Advisory Committee, Imperial Institute.

"Notes on Spotting of Crepe Rubber."
"Demonstrations in Budding."
By J. Mitchell, Organising Secretary.

Bulletins and Reports received.

J. MITCHELL,
Organising Secretary.

RUBBER RESEARCH SCHEME (CEYLON),
Peradeniya,
12th January, 1925.

EXPERIMENTS ON SMOKING RUBBER.

WASHING SHEETS AFTER SMOKING.

It is the practice on some Estates to scrub sheets with water after removal from the smoke-house, the sheets being then hung to air-dry for a few days before packing. In view of the opinion expressed in Third Quarterly Circular, p. 4, that it is of great importance that sheet should be packed as soon as possible after removal from the smoke-house, it was thought useful to carry out tests to determine whether the practice of washing smoked sheets has any effect on the susceptibility to mould-growth.

Two tests were carried out; one on sheet dried in the experimental smoke-chamber, and the other on sheet dried in an estate smoke-house. After smoking, the sheets were divided into 3 portions, and mould-growth tests were made as follows:—

I. On a portion of sheet after removal from the smoke-house.

II. On a portion of sheet scrubbed with water, and then hung in the drying room for 5 days.

III. On a portion of sheet hung in the drying room for 5 days.

Results of the tests were as follows:—

	Number of days before mould-growth started.		
	Test I.	**Test II.**	**Test III.**
	After removal from smoke-house.	Scrubbed and air-dried for 5 days.	Air-dried for 5 days.
Sheet from R. R. S. smoke-house ...	12	10	10
Sheet from estate smoke-house (considerably under-smoked ...	6	3	4

From the above it appears that whilst washing *per se* has had no distinct influence on the liability to mould-growth, the sheets become more liable to mould owing to the period of air-drying which is necessary.

It should be noted that the sheets which were washed showed less tendency to "sweat," but this defect can be more effectively prevented by thorough washing of the sheets after rolling, and by improving the ventilation of the smoke-house. It is thought that the necessity for washing sheets after smoking would be obviated by attention to the above points.

TESTS WITH GLASS HYDROMETERS FOR LATEX.

(See 2nd Quarterly Circular, p. 3).

A glass hydrometer constructed at the Research Scheme Laboratories has been in use on Estate A. since March, 1924. In this factory (smoked sheet) the daily crop as estimated from hydrometer and "Metrolac" readings is compared with the actual weight of rubber produced, the latter figure being obtained by weighing each day's output after removal from the smoke-house. Below are given figures to the end of November, supplied by the Superintendent.

	Actual crop. lbs.	Crop estimated from hydrometer readings lbs.	% Error.	Crop estimated from Metrolac readings lbs.	% Error.
March (4 days) ...	939	974	+ 3.7	1,132	+ 20.4
April ...	7,631	7,874	+ 3,2	9,086	+ 19.1
May (9 days) ...	1,607	1,605	—0.1	1,939	+ 20.0
June ...	6,617	6,271	—5.2	7,614	+ 15.0
July ...	6.618	6,315	—4.7	7,735	+ 16.9
August ...	7,010	6,670	—4.85	8,029	+ 14.5
September ...	4,071	3,859	—5.2	4,632	+ 13.8
October ...	7,731	7,147	—7.5	8,583	+ 11.0
November ...	7,256	6,834	—5.8	8,198	+ 13.0
TOTAL ...	49,480	47,549	—3.9	56,948	+ 15.1

(Metrolac new in March, 1924.)

A similar hydrometer was used on Estate C. for "weighing up" coolies latex (about 50 readings daily) for 5 months without breakage. In contrast to this it is only fair to mention that one hydrometer which was forwarded to London packed in cotton-wool was broken in transit.

Fifty hydrometers have been ordered, and a number will be available for factory tests. It is hoped that they will arrive in time to start the tests when tapping is resumed after wintering. The writer would be glad to get in touch with Estate Superintendents who would be prepared to test the hydrometer and keep records such as the above over a period of one year.

T. E. H. O'BRIEN,

Chemist, Rubber Research Scheme.

RESEARCH SCHEME LABORATORIES,
Culloden Estate,
Neboda,
January 3rd, 1925.

POSSIBLE EFFECT OF STOCKS ON SCIONS IN BUDDED RUBBER.

In a previous note on Budding of Rubber, I suggested that the origin of all stocks and the characters of their parents should be known, as well as that of scions. A few notes on known mutual effects of the two partners in the case of other plants may be of interest.

The primary object of vegetative propagation, in general, is to increase rapidly the number of plants possessing the desired feature in large amount. In fruit trees, scions from high production strains are grafted on to stocks already well established. This obviates the long period of waiting necessary if one were to raise the desired variety from seeds and, at the same time, cuts out the effects of chance pollenation of the mother tree with pollen from a less desirable variety. In the same way potatoes are grown from tubers (vegetative propagation), and so a crop is obtained annually instead of every five or six years as would be the case if seed were used.

In all cases of vegetative propagation it is generally stated that all the cuttings, layers, or grafts are identical in character with the mother plant. This is true with the first two, but here, no foreign tissue has been introduced; the roots although adventitious in origin are formed by the cutting and are part and parcel of the same plant. With grafts a slightly different state of affairs is brought about. A piece of one plant is induced to unite and live in partnership with a root-stock of another plant, in some cases belonging to a different botanical species or even genus. The effect of such living together, or symbiosis, is, on the whole, not nearly so noticeable as might be expected. The scion exhibits morphological characters practically identical with those of the mother tree, and the stock is unaltered. (I am not considering the

question of the so-called "graft hybrids," details of the nature of which can be found in any standard textbook of Botany.) Nevertheless close examination often reveals slight differences, some of which may be desirable, others less so. As an example it can be stated that in Pears "the scion is influenced in the size and flavour of its fruit, in the earliness or lateness of its fruit-bearing power, its habit of growth, and in other ways, by the stock on which it is grafted." (Percival, p. 263.)

Also from Percival: "Fruit trees on their own roots are less fruitful and the fruit is of poorer quality than that obtained from the same variety of tree grafted on another *appropriate* stock."

"The repressing or stimulating effects of certain scions on certain stocks is well known. Excellent examples are found in the various "dwarf" rootstocks used in the culture of Pome and citrous fruits. Besides the dwarfing effect of the stock on the scion, there is often a reciprocal stimulating effect of the scion upon the stock, which causes the latter to increase in diameter faster than the scion." (Babcock and Clausen, p. 383.)

In France various stocks are considered by the leading investigators to have the effect of either decreasing or increasing the production in the case of vines.

"The stock and graft influence one another in a variety of ways. For example, portions of annual plants grafted on perennials attain an extended period of life.....Qualitative changes may also be brought about and may go so far as to lead to a vegetative bud of the graft becoming transformed into a flowering shoot. The specific properties of the two components are, however, maintained in cases of transplantation,"—(Strassburger.)

In a recent number of "Tropical Agriculture" (Vol. I., No. V.) it was stated that the amount of fruit fall in a

particular variety of cotton might be greatly reduced by budding scions of this type on to stocks of another.

One other point which shows possible mutual effect is the fact that by living together the two plant portions are not forced to re-generate the lost parts. The scion is under no necessity of forming new roots in order to live, neither must the stock push out new assimilating branches, in fact any such tendency is usually checked.

With Rubber it is known that no very noticeable effects are produced in the Morphology of a plant by budding on to varying stocks. The occurrence of "elephant feet" possibly indicates the stimulating effect of the scion. It is not known whether the average yield of the trees of a plot of budded rubber, all with scions from the same tree, will equal the yield of the mother tree, although the variation in yield is certainly less than that observed in seed plots.

Until more is known on the subject it seems, in the face of the above evidence, to be a first essential that the different stocks be grown in separate beds in nurseries and scions from each mother tree be affixed to a certain number of each.

In this way the most satisfactory combination may be discovered and the operation can be repeated with the assurance that the best scion is being transplanted on to the most suitable stock available on the estate.

R. A. TAYLOR,
Physiological Botanist.

RESEARCH SCHEME LABORATORIES,
Culloden Estate,
Neboda,
January 3rd, 1925.

FIRST REPORT ON RUBBER PREPARED WITH SODIUM SILICOFLUORIDE AS A COAGULANT.

In connection with the experiments which are being carried out by the Rubber Growers' Association in Malaya on the use of sodium silicofluoride as a coagulant, a sample of smoked sheet prepared on Pataling Estate by this method was received for examination. It was stated that the sample formed part of a consignment forwarded for factory tests in this country, and that until the results of these tests were available the Association considered it inadvisable to make any recommendations as to the use of this coagulant on estates.

Description.—The rubbber was of good appearance and free from mould.

Results of Examination.—Vulcanising and mechanical tests were carried out in the standard rubber-sulphur and accelerator mixings employed at the Imperial Institute. As no sample of smoked sheet coagulated with acetic acid from the same estate was received the results of the tests are shown in the following table in comparison with the average results obtained with five recent samples of smoked sheet from Ceylon:—

A.—MIXING: 90 Rubber, 10 Sulphur.

	Time of Cure (mins).	Tensile strength (lbs./sq. in.).	Elongation. At Break, per cent.	Elongation. At Standard load per cent.	Slope.
Standard Cure. (Elongation at load of 1.04 kgs/sq. mm. = 775 per cent.)					
Present Sample ...	150	2,390	874	784	39
(Smoked Sheet average of 5 recent samples) ...	107	2,440	867	777	40
Tensile Optimum Cure. (Maximum tensile strength developed 72 hours after vulcanisation.)					
Present Sample ...	150	2,390	—	784	—
Smoked Sheet (average of 5 recent samples) ...	113	2,510	—	754	—

B.—ACCELERATOR MIXING:

90 Rubber, 5 Sulphur, 90 Zinc Oxide, 1 Hexamine.

	Time of Cure (mins.)	Tensile strength (lbs./sq. in.)	Elongation. At Break, per cent.	Elongation. At standard load per cent.	Slope.
Standard Cure. (Elongation at load of 1.04 kgs/sq. mm. = 480 per cent.)					
Present Sample ...	60	2,850	633	475	46
Smoked Sheet (average of 5 recent samples) ...	37	2,420	604	481	47
Tensile Optimum Cure. (Maximum tensile strength developed 72 hours after vulcanisation.)					
Present Sample ...	50	2,960	—	495	—
Smoked Sheet (average of 5 recent samples) ...	45	2,760	—	458	—

Remarks.

This rubber was very slow curing in both the rubber-sulphur and the accelerator mixings. Its tensile strength in the rubber sulphur mixing, like that of other rubbers having a long time of cure, was somewhat below the average. It had, however, an excellent tensile strength in the accelerator mixing.

The vulcanising and mechanical properties of the present samples are on the whole satisfactory, but, in the absence of a control sample, it is not possible to draw conclusions as to the precise effect of sodium silicofluoride as a coagulant.

In order to obtain definite information on this point it will be necessary to examine comparative samples prepared with sodium silicofluoride and with acetic acid from a number of estates.

IMPERIAL INSTITUTE,
LONDON, S. W. 7,
15th February, 1924.

SECOND REPORT ON RUBBER PREPARED WITH SODIUM SILICOFLUORIDE AS A COAGULANT.

In connection with the experiments which are being carried out by the Rubber Growers' Association in Malaya on the use of sodium silicofluoride as a coagulant, a sample of smoked sheet rubber prepared on Pataling Estate by this method was recently examined at the Imperial Institute.

The vulcanising and mechanical properties of this rubber were on the whole satisfactory, but no control sample was available for comparison. A sample of commercial smoked sheet rubber coagulated with acetic acid has therefore been obtained from this estate for examination.

Results of Examination.—The results of vulcanising and mechanical tests on both rubbers with the standard rubber sulphur and accelerator mixings employed at the Imperial Institute are shown in the following table :—

A.—MIXING : 90 Rubber, 10 Sulphur.

	Time of cure (mins.).	Tensile strength lbs. sq. in.	Elongation. At Break. per cent.	Elongation. At standard load per cent.	Slope.
Standard Cure. (Elongation at load of 1.04 kgs/sq. mm. = 775 per cent.)					
Commercial Smoked Sheet coagulated with acetic acid ...	140	2,360	864	780	40
Smoked Sheet coagulated with sodium silicofluoride ...	150	2,390	874	784	39
Tensile Optimum Cure. (Maximum tensile strength developed 72 hours after vulcanisation.)					
Commercial Smoked Sheet coagulated with acetic acid ...	140	2,360	—	780	—
Smoked Sheet coagulated with sodium silicofluoride ...	150	2,390	—	784	—

B.—ACCELERATOR MIXING: 90 Rubber, 5 Sulphur, 90 Zinc Oxide, 1 Hexamine.

	Time of cure (mins.)	Tensile strength lbs. sq. in.	Elongation. At Break. per cent.	Elongation. At standard load per cent.	Slope.
Standard Cure.					
(Elongation at load of 1.04 kgs/sq. mm. = 480 per cent.)					
Commercial Smoked Sheet coagulated with acetic acid ...	50	2,800	641	485	47
Smoked Sheet coagulated with sodium silicofluoride ...	60	2,850	633	475	46
Tensile Optimum Cure.					
(Maximum tensile strength developed 72 hours after vulcanisation.)					
Commercial Smoked Sheet coagulated with acetic acid ...	50	2,800	—	485	—
Smoked Sheet coagulated with sodium silicofluoride ...	59	2,960	—	495	—

Remarks.

It will be seen that the samples have given similar results both in the rubber sulphur and the accelerator mixing, and it appears therefore that smoked sheet rubber prepared from latex coagulated with sodium silicofluoride is similar in its behaviour on vulcanisation to smoked sheet rubber prepared from latex coagulated with acetic acid. In order however to obtain definite information as to the precise effect of sodium silicofluoride, it would be necessary to examine comparative samples from a number of estates. For this purpose samples of crepe and smoked sheet rubber should be prepared from a quantity of bulked latex by coagulating (1) with sodium silicofluoride and (2) with acetic acid.

IMPERIAL INSTITUTE,
LONDON, S. W. 7,
4th June, 1924.

THIRD REPORT ON RUBBER PREPARED WITH SODIUM SILICOFLUORIDE AS A COAGULANT.

Results of the vulcanising and mechnical tests which have been carried out at the Imperial Institute on a further sample of rubber prepared with sodium silicofluoride and on a control sample coagulated with acetic acid. These rubbers were taken from the consignment which was sent to America by the Rubber Growers' Association for tests by manufacturers.

RUBBER SULPHUR MIXING: 90: 10.

Coagulant.	Time of cure. (mins.)	When tested.	Tensile strength. (lbs. sq. in.)	Elongation		Slope.
				At break. (per cent.)	At standard load. (per cent.)	
Sodium-silicofluoride ...	92	Before ageing	1,570	953	943	40
		After ageing*	1,930	931	877	39
Acetic Acid (control) ...	80	Before ageing	1,480	960	957	41
		After ageing*	2,070	957	893	40

* By heating for 20 hours at 70°C in a current of air.

It will be seen that the sample coagulated with sodium silicofluoride is a little slower curing than the acetic acid coagulated control, thus confirming the results of previous experiments.

No important difference between the two rubbers developed on ageing.

A report by Dr. Stevens on samples taken from this consignment is published in the Bulletin of the Rubber Growers' Association, Vol. VI., No. 7, July, 1924.

IMPERIAL INSTITUTE,
LONDON, S. W. 7,
3rd September, 1924.

NOTES ON SPOTTING OF CREPE RUBBER.

During the past three months several samples of spotted crepe rubber (chiefly sole crepe) have been sent in for report and advice and it would appear that some trouble is being experienced in this connection.

While spotting of ordinary crepe greatly detracts from its appearance and is regarded as a serious defect, it is of particular importance when it appears in sole crepe and the occurrence of spots in the latter form of rubber might readily lead to a refusal to accept delivery and thereby cause much loss.

It seems desirable, therefore, to draw the attention of Subscribers to this matter so that they may take every precaution to prevent its appearance or to take early steps to deal with the trouble when it has appeared.

Spotted crepe rubber has been known for a good many years and accounts dealing with this defect have been published by Mr. O. T. Faulkner, Mr. C. K. Bancroft, and Mr. A. Sharples. Bulletin No. 19 of the F. M. S. Department of Agriculture gives a very full account of Mr. Sharple's investigations on the subject, and a good summary is given in Mr. Petch's book, "The Diseases and Pests of the Rubber Tree." More recently the study of this problem has been taken up by Members of the Staff of the Botanical Department of the Imperial College of Science and Technology, London, under the direction of Prof. J. B. Farmer (Member of the London Advisory Committee). Observations on these later investigations have been published in the R. G. A. Bulletins for September, 1923, May, 1924, and November, 1924, and Subscribers are referred to these Bulletins for fuller details It is the purpose of these notes to draw attention to the principal points referred to in the published accounts.

Cause.—Though it has been shown that Bacterium prodigiosus is a cause of pink spotting of rubber all the investigators give prominence to the occurrence of common mould fungi as the principal cause of spotting.

The discolourations are of various kinds, yellow spots, yellow flushes, violet spots, black spots, rusty patches, and red spots.

It would appear that the yellow and violet spots are caused by the exudation of colouring matter from the fungus threads into the rubber, but the black spots are caused by the massing of coloured mycelial threads.

Various colours may be produced by one fungus and the amount of colour is markedly affected by the nature of the medium in which the fungus is growing—the relative acidity of the medium is an important factor.

It has been found that fungus threads are present in unspotted rubber so that it is probable that all crepe rubber is liable to become spotted if conditions for the growth of the fungus are suitable. The main factor in this is the degree of moisture present and it has been found that growth of the fungus could be readily obtained when the moisture content was as high as 2%. It should be remembered that under suitable conditions rubber absorbs moisture after it has been thoroughly dried and may then become spotted. This suggests a reason for the occurrence of spots in rubber when it reaches its destination though quite free at the time it was packed.

As the spotting is caused by common moulds which are everywhere present it follows that infection may take place at any stage from the time the tree is tapped to the time when the rubber is thoroughly dried.

Prevention.—It has been found that rapid drying of the rubber after it leaves the machines is the most effective way of preventing the occurrence of these discolourations and whenever they appear immediate attention should be paid to the conditions affecting drying.

Where hot air driers are used it should be possible to avoid these defects, but care will be required to ensure that the rubber contains less than 2% of moisture when it is packed. Where air drying is practised ample accommodation will be required to ensure drying to this degree in from 5 to 7 days. Any longer period increases the liability to development of discolourations and steps will have to be made to improve the ventilation and in other ways secure more rapid drying.

It has been found that the use of an excess of acetic acid in coagulation makes the rubber more susceptible to spot disease and it is advisable that the minimum of acid required be used when this disease makes its appearance in the factory.

Though sodium bi-sulphite has a disinfecting action an excess of it causes a slower drying of the rubber and in that respect might lead to the development of spots. In bad cases the use of Formalin at the rate of 1 pint of Formalin to 100 gallons of latex may be resorted to as a preventive measure. It need hardly be urged that every attention should be paid to general cleanliness in preparation.

As the crepe for sole making is of a very close texture and when finished is relatively thick it follows that unless drying has been thoroughly carried out there is a danger of moisture being held in the rubber and this might conceivably lead to spotting during transit from the estate to the various markets of the world. It is in this connection that most complaints have been made, the sole crepe rubber having left the factory in apparently perfect condition, but having arrived London and New York more or less affected by coloured spots.

J. MITCHELL,
Organising Secretary.

DEMONSTRATIONS IN BUDDING.

At the Technical Committee Meeting of the Rubber Research Scheme held in January 14th, 1925, some concern was expressed at the apparent lack of interest being taken in the subject of "Budding of Rubber" in Ceylon and the Members of that Committee considered that in view of the rapid strides being made by Java and Sumatra, and to a slightly less extent by Malaya there is a distinct danger that Ceylon will, at some future time, be left behind in much to same way as took place in the Cinchona Industry.

Members of the Research Scheme are urged to take up this matter with greater vigour and as a preliminary step it is considered that every estate should obtain a reliable record of its best yielding trees from which buds can be taken when budding operations are carried out. The method adopted in Java is outlined in the First Quarterly Circular of the Rubber Research Scheme, copies of which were circulated to all Members during May, 1924, but any method which will lead to a reliable record being kept may be adopted.

Subscribers are asked to note that the Rubber Research Scheme is prepared to arrange for demonstrations in the technique of budding on Culloden Estate, Neboda, during April, 1925, and Estates desiring to take advantage of these demonstrations are asked to send in applications to the Secretary during March. It is also hoped to arrange for a demonstration of budding to take place at Peradeniya.

J. MITCHELL,
Organising Secretary.

BULLETINS AND REPORTS RECEIVED.

REPORTS FROM LONDON.

(*a*) Report on "Plasticity of Raw Rubber."

(*b*) First Report on "The effect of different conditions of smoking,"

(*c*) Report on "Drift Rubber washed up on the West Coast of Ceylon in 1923."

These Reports are to be considered by the Technical Committee.